Shaik Imam Hussain* et al.
(IJITR) INTERNATIONAL JOURNAL OF INNOVATIVE TECHNOLOGY AND RESEARCH
Volume No.4, Issue No.6, October – November 2016, 4623-4625.

Utilizing The Unused Glass Substance In Stand-In Of Cement

SHAIK IMAM HUSSAIN
M.Tech Student, Dept of Civil
SKR College Of Engineering & Technology
Nellore, Andhra Pradesh, India

V SAI BHARATH
Assistant Professor, Dept of Civil
SKR College Of Engineering & Technology
Nellore, Andhra Pradesh, India

Abstract: **Glass can be used in lots of forms in day-to-day existence. It's limited life time after utilize it is either stock stacked or delivered to landfills. Since glass is non-biodegradable, landfills don't offer an atmosphere friendly solution. Hence, there's strong have to utilize waste glasses. Many efforts happen to be designed to use waste glass in concrete industry like a substitute of coarse aggregate, fine aggregate and cement. Its performance like a coarse aggregate substitute has been discovered to become non-acceptable due to strength regression and expansion because of alkali-silica reaction. The study implies that there's strength loss because of fine aggregate substitution also. The purpose of the current work ended up being to use glass powder like a substitute of cement to evaluate the pozzolanic activity of proper glass powder in concrete and compare its performance along with other pozzolanic materials like silica fume and fly ash. A number of tests were conducted to review the result of 15% and 30% substitute of cement by silica fume, fly ash and glass powder on compressive durability and strength by means of capillary absorption. The particle size effect was evaluated by utilizing glass powder of size 150µm-100µm and glass powder of size under 100µm. The current study implies that waste glass, if ground finer than 100µm shows a pozzolanic behavior. It responds to lime at initial phase of hydration developing extra CSH gel therefore developing denser cement matrix. The first use of alkalis by glass particles mitigate alkali-silica reaction hence increase reliability of concrete.**

Keywords: **Glass Fiber; Pozzolanic Activity; Durability;**

I. INTRODUCTION

Concrete is a mix of cement, sand, coarse aggregate and water. The important thing component that adds value to concrete is it could be made to withstand harshest environments significant role. Today climatic change and ecological devastation have grown to be manifest harms recently, worry about ecological issues, along with a changeover in the mass-waste, mass-consumption, mass-production society of history to some zero-emanation society has become considered significant. Normally glass doesn't harm the atmosphere by any means because it doesn't produce pollutants, however it may damage humans in addition to creatures, otherwise worked carefully which is less friendly to atmosphere since it is non-biodegradable [1]. Thus, the introduction of technology continues to be needed. The word glass contains several chemical diversities including soda-lime silicate glass, alkali-silicate glass and boron-silicate glass. Up to now, these kinds of glasses glass powder happen to be broadly utilized in cement and aggregate mixture as pozzolana for civil works. The development of waste glass in cement will raise the alkali content within the cement. Additionally, it assists in bricks and ceramic manufacture also it preserves recyclables, decreases energy consumption and amount of waste delivered to landfill. As helpful recycled materials, glasses and glass powder mostly are utilized in fields associated with civil engineering, for instance, in cement, and coarse aggregate. Their recycling ratio is near to 100%, which is also utilized in concrete without negative effects in concrete durability . Therefore, it's considered well suited for recycling. Lately, Glasses and it is powder has been utilized like a construction material to lower ecological problems. The coarse and fine glass aggregates might cause ASR(alkali-silica reaction) in concrete , however the glass powder could suppress their ASR inclination, an impact much like extra cementations materials (SCMs). Therefore, glass can be used like a substitute of extra cementations materials.

II. PROPOSED WORK

The types of materials utilized in this present work are glass powder, Ordinary Portland cement(43 grade), fly ash, silica fumes, coarse aggregates and fine aggregates. Glass Powder: The glass powder used in our study is introduced from Kolkata market. These components replace the cement in mix proportion. Particle size distribution graph and XRD analysis Silica Fumes: The silica fume used in our jobs is provided by Structural Laboratory of Department of Civil Engineering, NIT Rourkela. Silica fume is extremely reactive pozzolanic material and it is a byproduct from producing plastic or Ferro- plastic metal. It's composed in the flue gases from electric arc furnaces. Silica fume is extremely fine powder, with particles about 100th occasions minor than average cement grain [2]. It will come in a water slurry form. It's used at 5% to 12% by mass of extra cementations materials for

concrete structures that need high strength. Fly Ash: The fly ash used in our jobs is provided by CPP2 of Rourkela steel plant. Fly ash is basically comprised of calcium oxide and plastic dioxide can be used an alternative or like a supplant for Portland cement. Fly ash is also referred to as Eco-friendly concrete. Ordinary Portland Cement: The OPC(43 grade) used in our jobs are of Ultratech brand. This really is utilized as primary binder within the mixes. Fine Aggregate: Naturally available sand from Koel river bed can be used as fine aggregate in our work. The most typical constituent of sand is silica, usually by means of quarto movement, that is chemical inert and difficult. Hence utilized as an excellent aggregate in concrete. Coarse Aggregate: The coarse aggregate obtainable in structural engineering lab of civil engineering department [3].

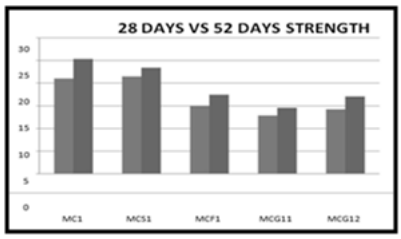

Fig.1.Compressive strength

III. METHODOLOGY

A nominal mixture of concrete of proportion 1:2:4 was utilized for that present study. The very first mix MC1 is control mix getting only cement as binder. The MCF series had fly ash as substitute of cement. The MCS & MCG series had silica fume and glass powder as substitute of cement. The compressive strength test was conducted to watch the force growth and development of concrete that contains 15% & 30% of those pozzolana as cement substitute. The particle size aftereffect of glass powder studied by utilizing glass powder of size (150-100)µ and (50-100)µ. Capillary absorption test is carried out to review the result of alkali aggregate reaction. The EDS analysis and SEM research into the mixes were completed to read the alternation in the morphological characteristics of concrete mixes. The tests were conducted in 2 series. In first Series thirty percent of pozzolana was utilized as partial substitute of cement. In second series 15% of pozzolana was utilized as partial substitute of cement [4]. Eleven figures of normal cubes (150x150x150 mm) were cast to determine the compressive strength after 28days and 52 days. Two cube were retained to determine capillary absorption after 4 weeks and 52 days correspondingly. The EDS analysis and SEM research into the mixes were done after 4 weeks and 52 days to review the modification within the morphological characteristics of concrete mixes. Normal consistency: Normal consistency of various binder mixes determined using the procedure talking about IS 4031: part 4 (1988) : 300 gram of sample coarser than 150µ sieve is taken. Approximate number of water put into sample and mixed methodically for just two-3 minutes. After applying oil towards the surface of mould, paste was completed the vicar's mould and it was placed directly under the needle of vicar's apparatus. Release rapidly the needle letting it sink within the paste and note lower the transmission studying once the needle becomes stable. When the transmission studying is under five to seven mm, prepare the paste again with increased water and repeat the above mentioned procedure before the needle penetrate to some depth of five to seven mm. The proportion from the water that the above mentioned scenario is satisfied is known as normal consistency. Compressive Strength Test: For every series five set were cast to find out compressive strength. Each set includes eleven standard cubes of that nine cubes were cast to determine the compressive strength after 28days and 52 days. How big the cube is as reported by the IS code 10086 - 1982. Capillary absorption Test: From eleven standard cubes two cubes were retained to determine capillary absorption coefficients after 4 weeks and 52 days curing correspondingly. This test is carried out to determine the capillary absorption which not directly measures the sturdiness. Procedure: The sample was dried in oven at 105ºC until constant mass was acquired. Sample was awesome lower to 70 degrees for 6hr. Alongside it from the sample was coated with paraffin to achieve unidirectional flow. The sample was uncovered to water somewhere by putting it on the pan full of water. The load from the sample was measured at 15 and half an hour times. The capillary absorption coefficient (k) was calculated by utilizing formula: k= Q/A* sort (t), where, Q= quantity of water absorbed, A = mix sectional area in touch with water t = time. Checking electron microscopy (SEM) and-dispersive X-ray (EDX) analysis was utilized to look at the character from the hydrated binder and also the binder-aggregate interfacial zones [5]. The EDX analyses will also be conducted . Observe that the height within the EDX spectra is proportional to the quantity of element present. The paste in Mix 2, which contained silica fume was discovered to possess been enriched with silica. The response product had small quantities of Na and enormous levels of Ca and silica. The compositions may reflect the composition from the pozzolanic reaction product. The SEM view and EDX composition from the reacted the surface of a GLP particle in Mix MCG11.Flakier glass partials may be seen in the vista. Near a glass particle (lower right) the fine needle-formed crystals within the paste are most likely ettringite. Case study shows a name of Na and interfacial bond failure is clearly visible.

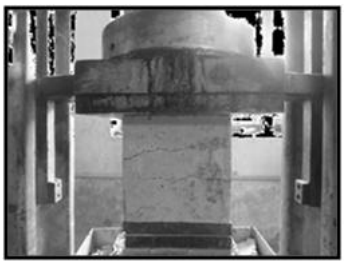

Fig.2.Compression test

IV. CONCLUSION

Waste glass, if ground finer than 100µm shows a pozzolanic behavior. The smaller sized particle size the glass powder has greater activity with lime leading to greater compressive strength within the concrete mix. When compared with fly ash concrete, finer glass powder concrete had slightly greater early strength in addition to late strength. Micro structural examination implies that glass powder creates a denser matrix which increases the durability property of concrete. The coefficient of capillary absorption test also signifies that incorporation of finer glass powder improves durability. Glass powder of size 150µm - 100µm exhibit initiation of alkali aggregate reaction. The existence of ettringite confirms this. The information presented within this study signifies that silica fume is better SCM. It provides greatest compressive strength due to its smaller sized grain size and spherical shapes. The outcomes acquired in the present study imply that there's great possibility of the effective use of best glass powder in concrete as substitute of cement. The fine glass powder can be used a substitute for costly materials like silica fume and fly ash. It may be figured 30% of glass powder of size under 100µm might be incorporated as cement substitute in concrete with no unfavorable effect.

V. REFERENCES

[1] Li Yun-feng, Yao Yan, Wang Ling, "Recycling of industrial waste and performance of steel slag green concrete", J. Cent. South Univ. Technol.(2009) 16: 8−0773, DOI: 10.1007/s11771-009-0128-x

[2] Mateusz R.J. O. and Tommy N. " Effect of composition and Initial Curing Conditions of Scaling Resistance of Ternary(OPC/FA/SF) concrete", Journal of Materials in Civil Engineering © ASCE/October 2008, PP 668-677.

[3] Turkmen.I," Influence of different curing conditions on the physical and mechanical properties of concrete with admixtures of silica fume and blast furnace slag", Materials Letters 57 (2003), pp.4560-4569.Article/ View Record in Scopus/Cited by in Scopus(9).

[4] Thomas , M. D. A. and Shehata, M. H. " Use of ternary cementitious systems containing silica fume and fly ash in concrete "; cementand concrete research 29 (1999). Bijen, J. " Benefits of slag and fly ash " construction and building materials , vol.10, no.5,pp. 309-314, 1996.

[5] Patel, A, Singh, S.P, Murmoo, M. (2009), "Evaluation of strength characteristics of steel slag hydrated matrix" Proceedings of Civil Engineering Conference-Innovation without limits (CEC-09), 1^{8th} - 1^{9th} September" 2009.

AUTHOR's PROFILE

Shaik Imam Hussain completed his Btech in Geethanjali Institute Of Science And Technology IN 2014. Now pursuing Mtech in Civil Engineering in SKR College of Engineering & Technology, Manubolu

V Sai Bharath , received his Mtech degree, currently He is working as an Assistant Professor in SKR College of Engineering & Technology, Manubolu

